

# Mythos and Logos in Hesiod's *Theogony*, Circa 700 B.C.

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Hesiod's *Theogony*, a completely preserved poem, is dated from about 700 B.C. It depicts partly a development, partly a situation that has arisen in the course of time in the world. It constitutes an attempt to understand the cosmos as the product of a genealogical evolution, which can be seen as a process of successive separation, differentiation, and hierarchization. In this attempted picture of the world myth and reality are inextricably interwoven. Observations of natural phenomena as far as of congenital malformations are accordingly exaggerated and undergone mythical transformation. Entities enumerated in this genealogical poem, no matter whether they stand for parts and concrete phenomena of the physical world or intellectual properties and abstract concepts, behave, think, and act, and are accordingly thought of, in anthropomorphic terms. Monogamy, polygamy, endogamy, exogamy, asexual and sexual reproduction, multiple conceptions and births, dominantly and recessively inherited traits, normal and abnormal offspring, and perceptions and notions on cosmogony, isogamy, and teratogenesis could be observed in the writing of the *Theogony* and interpreted by rational modern concepts.

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**KEY WORDS:** history of medicine, ancient; abnormalities, multiple; pregnancy, multiple; hermaphroditism; twins, conjoined; chimerism; teratogenesis

## INTRODUCTION

The field of genetics has been explosively expanded during our days. Our ancestors were no less concerned with concepts of heredity and it is upon their well-laid foundations that we continue to build. Hypotheses concerning reproduction and descent in antiquity are to be found in the extant works of Helladic, Hellenic, and Hellenistic nature philosophers. While cosmological problems are inextricably bound up with biological theories in these works, there is much valuable material from which we now can profit [Stubbe, 1972].

These ancient authors have already provided some data relevant to the history of human genetics [Stubbe, 1972; Bartsocas, 1984; Vogel and Motulsky, 1986, pp. 9–10] including early descriptions of genetic disorders [Bartsocas, 1982, 1985] and theories of cognition [Naso, 1990]. Epic, dramatic, and historical literature also provides solid information regarding genetic ideas, including those which reflect popular notions current at the time [Bazopoulou-Kyrkanidou, 1992].

Homer and Hesiod are the most prominent epic sources. They crystallize traditions of ancient culture, history, theology, and epistemology. One of Hesiod's poems, the *Theogony*, deserves a special attention from a genetic point of view, since by definition it is a genealogical poem. It seems then, that the *Theogony* is well worth a closer study and analysis, and an attempt to be interpreted by rational modern concepts. But, let us first make an introductory acquaintance of Hesiod and his *Theogony*.

Hesiod is a poet of the archaic period of the Greek literature. His poems, among them the completely preserved *Theogony*, are dated from about 700 B.C. Hesiod grew up in Ascra, a village of Boeotia in central Greece. In his youth he lived as a shepherd on the mountains; later he worked the land that he inherited from his father. As he describes in the prooemium to the *Theogony*, it was the Muses' voices that awoke poetry in him. In the *Theogony* we find every kind of mixture of traditional stories with Hesiod's own invention. The *Theogony* depicts, partly a development, partly a situation that has arisen in the course of time in the world in which we all live [Lesky, 1966, p. 91]. It constitutes an attempt to understand the cosmos as the product of a genealogical evolution and a process of individuation which ultimately achieves its *telos* (aim) under the tutelage of Zeus. This genealogical evolution can be

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seen as a process of successive separation, differentiation, and hierarchization [Clay, 1993].

At the beginning of his cosmogony stands Chaos, but next comes Gaea (Earth), and Eros (Love), arisen of their own, not by an act of creation [Hes. *Th.* 116–122]. After that the sequence of begetting and pairing begins. Eros is not credited with any progeny, but his position among the primordial deities of Chaos and Gaea is by inference vital for procreation. The increasing posterity is divided into two branches that remain sharply set apart: of Chaos and of Gaea. In the Gaea's pedigree the main line of development follows the succession of three divinities as world rulers: Uranus (Heaven), Cronus, and Zeus. Cronus castrates his father Uranus and thus wins the kingdom. He devours his own children, but his wife Rhea saves the new-born Zeus from him and conceals him in Crete, where he grows up to be the future ruler of the universe. In battle with the Titans, Zeus wins the throne for all time [Lesky, 1966, p. 94]. In the *Theogony* the theme is not solely the succession of different divine rulers, but an evolution leading up to Zeus. The Olympian sky-god is no vulgar tyrant, as the others were: in him a great and everlasting ordinance is fulfilled.

As the number of entities increases, so the main lines of cosmogony recede into the background. Hesiod does not in fact devote any more space to coming-to-be; he rather proceeds to the explanation of the existing, to the representing of the beings and powers of this world. In this attempted picture of the world, myth and reality are inextricably interwoven; or, more accurately, the age was one which saw the reality of the universe only in the shape of myth [Lesky, 1966, p. 97].

By this investigation I propose to present in biomedical terms, what is logos, i.e., reason and reflection on reality, in Hesiod's *Theogony* mythos, i.e., narrative without distinction of true or false [Liddee et al. (LSJ), 1990].

Entities enumerated in this genealogical poem, no matter whether they stand for parts and concrete phenomena of the physical world or intellectual properties and abstract concepts, behave, think, and act, and are accordingly thought of in anthropomorphic terms. Monogamy and polygamy, endogamy and exogamy, asexual and sexual reproduction, normal and teratogenic offspring, and many more biological events are depicted in the *Theogony*. Interestingly, although this unique narrative could be seen as a product of imagination, parts of it may derive from observations of natural life and biological events, which through exaggeration and modification fit into a mythological story. The conditions that may have served as models for imaginary products are exemplified in the biological kingdom in humans, animals, and plants. Using this point of view, and in my knowledge of biology, genetics, and pathology, I will try to present correlations of several real examples that parallel Hesiod's fictional stories. Such an attempt is challenging to the modern geneticist, because this detailed systematic genealogy recounted by Hesiod is an ancient genealogical map that is amenable to modern genetic interpretation. He gives a full record of the genealogy of the Greek gods defining

an individual divinity by name, by identifying epithet or description, and, above all, in genealogical terms, as the product of a certain parentage, and, in turn, as the generator of certain offspring [Philippson, 1936, pp. 9–10]. Although the anthropomorphic gods behave like humans, at the same time, they represent the factors for which they have been named, which range from parts of the physical world to abstract concepts.

## OBSERVATIONS, COMMENTS, AND PROPOSED INTERPRETATIONS

### What the Muses Bade Hesiod

‘... and this word first the goddesses **said to me—the Muses** of Olympus, daughters of Zeus who holds the aegis:

‘... we know how to speak many false things as though they were true; but **we know, when we will, to utter true things.**’

So said the ready-voiced daughters of great Zeus, ... and **they breathed into me a divine voice to celebrate things that shall be and things that were aforetime;** ...’ [Hes. *Th.* 24–32].

**Comments.** It has been postulated that the poetic language does not transmit factual information; it creates a world of its own, a world in which gods lead their lives [Burkert, 1985, p. 125]. This postulate, for the *Theogony* at least, sounds arbitrary. Because, if we pay a bit of attention to the prooemium, we may be able to understand what the above verses plainly show: Hesiod feels called to enshrine truth in his verses, while he gives a sideways glance at those who make such a promise without fulfilling it [Lesky, 1966, p. 92].

### Cosmogony: The Origin of Life (Fig. 1)

‘Verily at the **first Chaos** (I-1) **came to be**, but **next wide-bosomed Gaea** (Earth, I-2), the ever sure foundation of all the deathless ones who hold the peaks of snowy Olympus, and dim Tartarus in the depth of the wide-pathed Earth, **and Eros** (Love) (I-4), fairest among the deathless gods, who unnerves the limbs and overcomes the mind and wise counsels of all gods and all men within them [Hes. *Th.* 116–122].

‘And **Gaea first bare starry Uranus** (Heaven), **equal to herself**, to cover her on every side and to be an ever-sure abiding-place for the blessed gods. **And** she brought forth long **Hills**, graceful haunts of the goddess-Nymphs who dwell among the glens of the hills. She bare **also** the fruitless (‘απρύγετον πέλαγος’: unharvested sea [LSJ, 1990]) deep with his raging swell, **Pontus**, without sweet union of love’ [Hes. *Th.* 126–132].

**Comments.** Chaos, the yawning deep, Gaea (Earth), and Eros, an indefinite reproductive influence, appear coming into spontaneous existence and not by an act of creation. Tartarus already exists in the depths of earth. Earth by herself produces primarily the equal to herself starry heaven, the hills, and the unharvested sea, so, they all have a common origin.

Eros is not only the god of sexual desire, but of desire conceived of as leading to procreation. Scholars have long seen that Eros occupies a position among the primordial deities, Chaos and Gaea, because without him *Theogony* can only occur by parthenogenesis [Clay, 1993].

**Biologic interpretation.** Religion, mythology, and philosophy have proposed a variety of answers to the problem of origin of life. Most of them share the assumption that the phenomenon must be attributed to an agency outside nature, a creator. The modern theorists do suggest that life could and did arise spontaneously from nonliving matter under the conditions prevailing on the early earth, and that it is from such beginnings that all present earthly life has descended [Keeton and Gould, 1986, p. 998, chapter 37]. All life on earth has a universal genetic code. A question arises though: if any life is ever discovered on other planets would it be based upon the same genetic code as that on earth? Hesiod from the beginning talks about the equal to earth starry heaven. Does this imply the Universe?

### Reproductive Patterns

**Asexual Reproduction: Chaos' Pedigree (Fig. 2).** «From **Chaos** (I-1) came forth **Erebus** (II-1) and black **Night**» (II-2) [Hes. *Th.* 123].

«But abhorred **Eris** (Strife) (III-17) **bare** painful **Toil** (IV-1) and **Forgetfulness** (IV-2) and **Famine** (IV-3) and tearful **Sorrows** (IV-4), **Fightings** (IV-5) also, **Battles** (IV-6), **Murders** (IV-7), **Manslaughters** (IV-8), **Quarrels** (IV-9), **Lying Words** (IV-10), **Disputes** (IV-11), **Lawlessness** (IV-12) and **Mischief** (Ruin) (IV-13), all of one nature, and **Oath** (IV-14) who most troubles men upon earth when anyone willfully swears a false oath» [Hes. *Th.* 226–233].

**Comments.** There are two examples of asexual reproduction in Chaos' pedigree constructed on the basis of the Hesiod's narrative. According to the gender of the names in the Greek language, one of the individuals that reproduce asexually is female (**Eris**) and one (**Chaos**) is neuter, has no sex. **Eris** bare males, females, and neuters, and from **Chaos** came forth one neuter and one female.

**Biologic interpretation.** The case of **Eris**-female could be called amphitoky parthenogenesis (unfertilized eggs develop into either sex) [Rieger et al., 1976]. What about **Chaos**? Genetically, what does neuter represent?

**Both Sexual and Asexual Reproduction: Gaea's Pedigree (Fig. 1).** «**Gaea** (Earth (I-2) first **bare** starry **Uranus** (Heaven) (II-1), equal to herself, to cover her on every side, . . . and she **brought forth** long **Hills** (II-2) . . . She **bare also** the fruitless (ατρύγετον πέλαγος: unharvested sea [LSJ, 1990]) deep with his raging swell, **Pontus** (Sea) (II-3), **without sweet union of love**» [Hes. *Th.* 126–132].

«But afterwards **she** (**Gaea**) **lay with Uranus** (Heaven) and **bare** . . . (the **Titans**, III-1 to III-12; the **Cyclopes**, III-13 to III-15, and the **Hecatoncheires** = Hundred-handed, III-16 to III-18)» [Hes. *Th.* 132–150].

«And yet again **he** (**Pontus**) **got great Thaumás** (III-25) and proud **Phorcys** (III-26), **being mated with Gaea** (Earth), and fair-cheeked **Ceto** (III-27) and **Eurybia** (III-28)» [Hes. *Th.* 237–239].

«Lastly, **he** (**Zeus**) (IV-31) made **Hera** (IV-28) his blooming wife: and she **was joined in love with the king** of gods and men, and **brought forth Hebe** (V-37) and **Ares** (V-38) and **Eileithia** (V-39)» [Hes. *Th.* 921–923].

«But **Hera without union with Zeus**—for she was very angry and quarrelled with her mate—**bare** famous **Hephaestus** (V-36), who is skilled in crafts more than all the sons of Heaven» [Hes. *Th.* 927–928].

And from another recension of lines 924–929 [Evelyn-White, 1959]:

«But **Hera** was very angry and quarrelled with her mate. And because of this strife **she bared without union with Zeus** who holds the aegis a glorious son **Hephaestus**, who excelled all the sons of Heaven in crafts»).

**Comments.** **Gaea** bore asexually two males and neuters. Then, she lay with her two sons and had children of both sexes. **Hera**, joined in love with **Zeus**, brought forth two female and a male children. But, afterwards, she bore without union with **Zeus** a son.

**Biologic interpretation.** **Gaea** could be an androgynous-hermaphroditic individual since she bore males. But, **Gaea's** example of asexual reproduction could be also considered parthenogenetic arrhenotoky (unfertilized eggs develop parthenogenetically into males) [Rieger et al., 1976].

**Hera**, she could be considered an androgynous-hermaphroditic individual being able to reproduce after mating with **Zeus** and then to have a son by self-fertilizing. Alternatively, **Hera's** case of asexual reproduction could be called parthenogenetic arrhenotoky, as in **Gaea's** case. In both **Gaea** and **Hera**, a cyclic parthenogenesis could be considered, i.e., one or more parthenogenetic generations alternate with a bisexual (amphigonic) generation (heterogony) [Rieger et al., 1976].

Of course, in mammals parthenogenesis is impossible [Solter, 1988]. Imprinting of genome precludes parthenogenesis, but homozygous uniparental embryos of gynogenetic composition were rescued to reproduce in mouse chimeras with normal biparental embryos [Market, 1988]. No matter what the manufacture of mouse chimeras has made possible, in Hesiod's story, and especially for **Gaea's** case, one could think that there is an extension of the myth to biologic phenomena which do exist in all vertebrate classes except for mammals, thus reminding the unicity of Nature and the universality of the genetic code. This is again shown by the unions of **Gaea** with her two sons from which all the beings of the world emerged.

A minor point which requires our attention is: «**Gaea** first bare starry **Uranus**, **equal to herself**, to cover her on every side». Does it mean that **Gaea** (the first female in the *Theogony*) bore **Uranus** (the first male) equal to herself in size, in strength, in rights? Or, being an hermaphrodite, she was equally divided and thus **Uranus** was formed? Mittwoch [1985] discusses ancient myths of an hermaphrodite origin of man and his subsequent bisection into male and female individuals, and the confirmation of this idea from the embryological evidence of sexual development.

**Chaos' pedigree (Fig. 2).** «but of **Night** (II-2) **were born Aether** (III-1) and **Day**, whom she **conceived and bare from union of love with Erebus** (II-1)» [Hes. *Th.* 124–125].

«And **Night** (II-2) **bare** hateful **Doom** (III-3) and black **Fate** (III-4) and **Death** (III-5), and **she bare**

**Sleep** (III-6) and the tribe of **Dreams** (III-7). And again the goddess murky **Night, though she lay with none, bare Blame** (III-8) and painful **Woe** (III-9), and the **Hesperides** (III-10) who guard the rich, golden apples and the trees baring fruit beyond glorious Ocean. Also **she bare the Destinies** (III-11) and ruthless avenging **Fates** (III-12), Clotho and Lachesis and Atropos, who give men at their birth both evil and good to have, . . . Also deadly **Night bare Nemesis** (Indignation) (III-13) to afflict mortal men, and after her, **Deceit** (III-14) and **Friendship** (III-15) and hateful **Old Age** (III-16) and hard-hearted **Eris** (Strife) (III-17)» [Hes. *Th.* 211–225].

**Comments.** Night (female) conceived and bore from union in love with Erebus (neuter) one male and one female child and then she bore asexually 15 children of both sexes including a neuter.

**Biological interpretation.** Night, as well, can reproduce both with and without sex. What is important though is that she conceives from a union with a neuter individual. Erebus has no sex but gives gametes capable of fertilizing Night's eggs and generating individuals of both sexes. Could it stand for an early form of fertilization complementary to the theory on the origin and evolution of reproduction? Night's asexual reproduction giving birth to individuals of both sexes could be called amphitoky parthenogenesis, i.e., unfertilized eggs develop into either sex [Rieger et al., 1976]. Night's case could be also considered as cyclic parthenogenesis, i.e., one or more parthenogenetic generations alternate with bisexual (amphigonic) generation (heterogony) [Rieger et al., 1976].

**Gaea's pedigree (Fig. 1).** «And **Pontus** (Sea, II-3) begat **Nereus** (III-24) the eldest of his children, who is

true and lies not: and men call him the Old Man because he is trusty and gentle and does not forget the laws of righteousness, but thinks just and kindly thoughts. And yet again **he got great Thaumas** (III-25) and proud **Phorcys** (III-26), **being mated with Gaea** (Earth) (I-2), and fair-cheeked **Ceto** (III-27) and **Eurybia** (III-28) who has a heart of flint within her» [Hes. *Th.* 233–239].

**Comments.** Pontus, a male, gave birth to a male, Nereus. Then, being mated with Gaea, he sired children of both sexes.

**Biological interpretation.** Pontus could be considered an hermaphroditic individual (Hermaphroditus is not mentioned in the *Theogony*) being able to self-fertilize but, also, to cross with other individual (Gaea) and have children by sexual reproduction. Scholars interpreted the adjective *ατρύγετος*, which Hesiod used to describe Pontus [Hes. *Th.* 131, 736–737, 695], as fruitless or barren [Evelyn-White, 1959; Clay, 1993]. Pontus cannot be considered to be barren since he reproduces both asexually and sexually. Moreover, *ατρύγετος* also means unharvested [LSJ, 1990]. It is my opinion that unharvested is the meaning of the word *ατρύγετος* that is given by Hesiod. Pontus (Sea) is full of living plants and animals, actually, so full that it is impossible to be harvested simply by fishing. In addition, for *ατρύγετος* the meaning of unharvested has been preserved and is still used in modern Greek.

A case of a man who gave birth to a child is cited by C. Stern [1968, p. 27] under the title «A lansquenet bears a child». It was considered a great miracle, set down and described by notaries, recorded in the chronicles from Piadena in Italy, on the 26th of May 1601. It is about a man «having natural organs of a man for passing wa-

Fig. 1. *The Theogony*, Gaea's pedigree (Hesiod, c. 700 B.C.). Note: sex symbols to anthropomorphic divinities and other creatures are given according to the gender (masculine, feminine, or neuter) of the names in the Greek language. I GENERATION: I-1 Chaos, I-2 (Gaea (Earth), I-3 Tartarus, I-4 Eros (Love). II GENERATION: II-1 Uranus (Heaven), II-2 Hills, II-3 Pontus (Sea). III GENERATION: III-1 Oceanus, III-2 Coeus, III-3 Crius, III-4 Hyperion, III-5 Iapetus, III-6 Theia, III-7 Rhea, III-8 Themis, III-9 Mnemosyne, III-10 Phoebe, III-11 Tethys, III-12 Cronos, III-13 Cyclop Brontes, III-14 Cyclop Steropes, III-15 Cyclop Arges, III-16 Hecatoncheir Cottus, III-17 Hecatoncheir Briareos, III-18 Hecatoncheir Gyges, III-19 Erinyes, III-20 Giants, III-21 Nymphs Meliae; III-22 Aphrodite (or Cytherea, Cyprogenes, Philommedes), III-23 Anceises; III-24 Nereus; III-25 Thaumas, III-26 Phorcys, III-27 Ceto, III-28 Eurybia. IV GENERATION: IV-1 3.000 Rivers, IV-2 3.000 Oceaninai (including the following down to 14), IV-3 Electra, IV-4 Doris, IV-5 Clymene, IV-6 Callirrhoe, IV-7 Idyia, IV-8 Perseis, IV-9 Europa, IV-10 Metis, IV-11 Eurynome, IV-12 Calypso, IV-13 Odysseus, IV-14 Styx; IV-15 As-traeus, IV-16 Pallas, IV-17 Perses; IV-18 Helios (Sun), IV-19 Selene (Moon), IV-20 Tithonus, IV-21 Eos (or Erigeneia, Dawn), IV-22 Cephalus; IV-23 Leto, IV-24 Asteria; IV-25 Hestia, IV-26 Iasion, IV-27 Demeter, IV-28 Hera, IV-29 Hades (or Aidoneus), IV-30 Poseidon (or Earth-Shaker, Blue-haired one), IV-31 Zeus, IV-32 Alcmena; IV-33 Aeneas; IV-34 Graia Pemphredo, IV-35 Graia Enyo, IV-36 Gorgon Stheno, IV-37 Gorgon Euryale, IV-38 Gorgon Medusa, IV-39 Snake; IV-40 Typhoeus. V GENERATION: V-1 50 Nereids (including those to V-6), V-2 Amphitrite, V-3 Peleus, V-4 Thetis, V-5 Aeacus, V-6 Psamathe; V-7 Atlas, V-8 Meoetius, V-9 Prometheus, V-10 Epimetheus; V-11 Athene (or Tritogeneia); the three Charites (the Graces): V-12 Euphrosyne, V-13 Thaleia, V-14 Aglaea; V-15 Nausithous, V-16 Nausinous; V-17 Zelus (Emulation), V-18 Nike (Victory), V-19 Cratos (Strength), V-20 Bia (Force); V-21 Zephyrus, V-22 Boreas, V-23 Notus, V-24 Eosphorus (Dawn-Bringer), V-25 stars; V-26 Hecate; V-27 Circe, V-28 Aeetes; V-29 Memnon, V-30 Emathion; V-31 Phaethon; V-32 Apollo, V-33 Artemis; V-34 Plutus; V-35 Persephone; V-36 Hephaestus; V-37 Hebe, V-38 Ares, V-39 Eleithia; V-40 Cemopolea; the Horae (Hours): V-41 Eunomia (Order), V-42 Dike (Justice), V-43 Eirene (Peace), the Moerae (Fates): V-44 Clotho, V-45 Lachesis, V-46 Atropos; the nine Muses: V-47 Cleio, V-48 Euterpe, V-49 Thaleia, V-50 Melpomene, V-51 Terpsichore, V-52 Erato, V-53 Polymnia, V-54 Urania, V-55 Calliope; V-56 Heracles; V-57 Iris, the Harpies: V-58 Aello (Storm-swift), V-59 Ocypetes (Swift-flier); V-60 Chrysaor, V-61 Pegasus; V-62 winds. VI GENERATION: VI-1 Achilles; VI-2 Phocus; VI-3 Maia; VI-4 Triton; VI-5 Agrius, VI-6 Latinus, VI-7 Telegonus; VI-8 Iason, VI-9 Medea; VI-10 Panic, VI-11 Fear, VI-12 Cadmus, VI-13 Harmonia; VI-14 Geryones, VI-15 Echidna. VII GENERATION: VII-1 Hermes; VII-2 Medeus; VII-3 Ino, VII-4 Semele, VII-5 Agave, VII-6 Aristaeus, VII-7 Autonoe, VII-8 Polydorus; VII-9 Orthus, VII-10 Cerberus, VII-11 Hydra of Lerna, VII-12 Chimaera. VIII GENERATION: VIII-1 Dionysus, VIII-2 Ariadne; VIII-3 Sphinx, VIII-4 Nemean lion. (Modified from Bazopoulou-Kyrkanidou, 1992, with permission of the publisher).



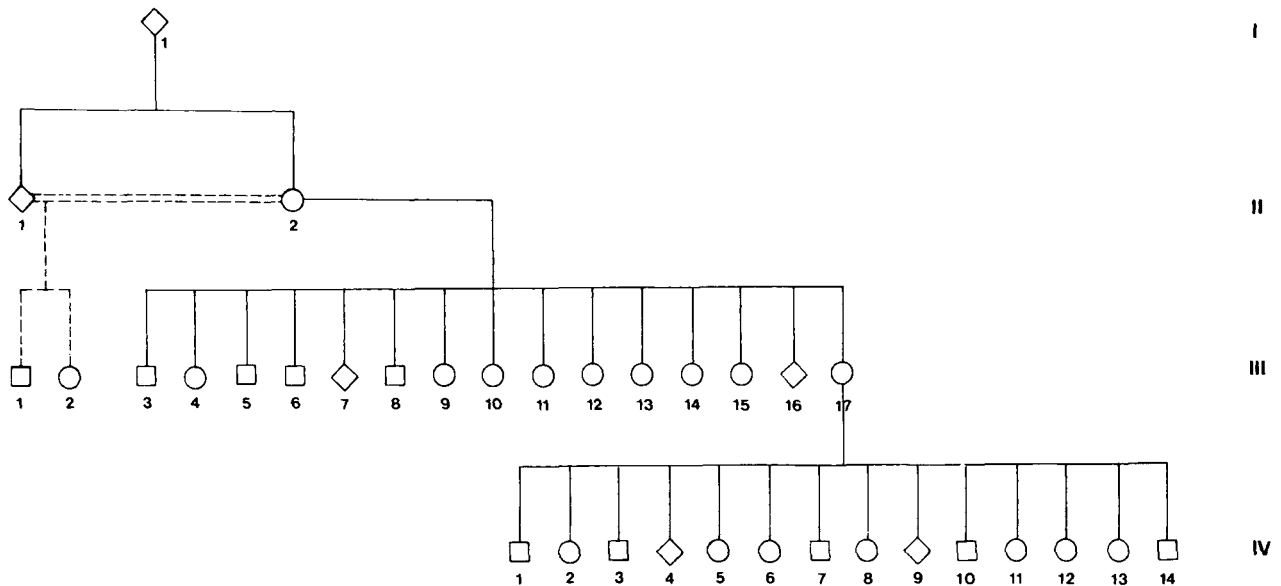


Fig. 2. Chaos' pedigree. Note: sex symbols to anthropomorphic divinities are given according to the gender (masculine, feminine, or neuter) of the names in the Greek language. I GENERATION: I-1 Chaos. II GENERATION: II-1 Erebus, II-2 Night. III GENERATION: III-1 Aether, III-2 Day, III-3 Doom, III-4 Fate, III-5 Death, III-6 Sleep, III-7 Dreams, III-8 Blame, III-9 Woe, III-10 Hesperides, III-11 Destinies, III-12 Fates: Clotho and Lachesis and Atropos, III-13 Nemesis (Indignation), III-14 Deceit, III-15 Friendship, (III-16) Old Age, III-17 Eris (Strife). IV GENERATION: IV-1 Toil, IV-2 Forgetfulness, IV-3 Famine, (IV-4) Sorrows, IV-5 Fightings, IV-6 Battles, IV-7 Murders, IV-8 Manslaughters, IV-9 Quarrels, IV-10 Lying Words, IV-11 Disputes, IV-12 Lawlessness, IV-13 Mischief, IV-14 Oath. (Modified from Bazopoulou-Kyrkanidou, 1992, with permission of the publisher).

ter», married to a woman for seven years without having children with her, but who, after he only slept once with a Spaniard, became pregnant therefrom, and gave birth to a girl. He was also able to suckle the child with his right breast only and not at all on the left side, where he was a man. This man seems to represent a case of hermaphrodite who conceived sexually. A painting by Jusepe de Ribera (1591–1652) called «The Bearded Woman» (1631) illustrates a man, who was a real person, suckling an infant with his right breast [Plagens, 1992]. At that time, Ribera lived in Italy.

True hermaphroditism is a rare cause of intersexuality in which both ovarian and testicular tissues are present in the same individual. Amongst 283 published cases of human true hermaphroditism reviewed by Krob et al. [1994], there were 21 pregnancies in ten individuals.

### Polygamy

**Polygyny (Fig. 1).** *Zeus (IV-31).* «Now Zeus, king of gods, made **Metis** (μητις: wisdom) (IV-10) his wife first, and she was wisest among gods and mortal men. But when she was about to bring forth the goddess bright-eyed Athene, Zeus craftily deceived her with cunning words and put her in his own belly» [Hes. *Th.* 886–890].

«Next he married bright **Themis** (θέμις: justice) (III-8) who bare the Horae (Hours) . . . and the Moerae (Fates)» [Hes. *Th.* 901–905].

«And **Eurynome** (IV-11), the daughter of Ocean, beautiful in form, bare him three fair-cheeked Charites (Graces)» [Hes. *Th.* 907].

«Also he came to the bed of all-nourishing **Demeter** (IV-27) and she bare white-armed Persephone» (IV-35) [Hes. *Th.* 912–913].

«And again he loved **Mnemosyne** (μνημοσύνη: remembrance, memory) (III-9) with the beautiful hair: and of her the nine gold-crown Muses were born» [Hes. *Th.* 915].

«And **Leto** (IV-23) joined in love with Zeus who holds the aegis, and bare Apollo and Artemis» [Hes. *Th.* 918, 920].

«Lastly he made **Hera** (IV-28) his blooming wife: and she was joined in love with the king of gods and men and brought forth Hebe and Ares and Eileithyia» [Hes. *Th.* 921–922].

«And **Maia** (VI-3), the daughter of Atlas, bare to Zeus glorious Hermes, the herald of the deathless gods, for she went up into his holy bed» [Hes. *Th.* 938–939].

«And **Semele** (VII-4), daughter of Cadmus joined with him in love and bare him a splendid son, joyous Dionysos, a mortal woman an immortal son. And now they both are gods» [Hes. *Th.* 940–942].

«And **Alcmene** (IV-32) was joined in love with Zeus who drives the clouds and bare him mighty Heracles» [Hes. *Th.* 943–944].

*Poseidon (IV-30).* «With her (Gorgon **Medusa**) (IV-38) lay the Dark-haired One (Poseidon) in a soft meadow amid spring flowers. And when Perseus cut off her head, there sprang forth great Chrysaor and the horse Pegasus» [Hes. *Th.* 278–281].

«And of **Amphitrite** (V-2) and the loud-roaring Earth-Shaker (Poseidon) was born great, wide-ruling

Triton (VI-4), and he owns the depths of the sea, living with his dear mother and the lord his father in their golden house, an awful (δεινός) god» [Hes. *Th.* 930–933].

*Odysseus* (IV-13). «And **Circe** (V-27) the daughter of Heliuss, Hyperion's son, loved steadfast Odysseus and bare Agrius and Latinus who was faultless and strong; also she brought forth Telegonus by the will of golden Aphrodite» [Hes. *Th.* 1011–1014].

«And the bright goddess **Calypso** (IV-12) was joined to Odysseus in sweet love, and bare him Nausithous and Nausinous» [Hes. *Th.* 1017–1018].

**Comments.** Zeus mates with ten females, whose ages range over several generations; three of them, namely, Metis, Themis, and Hera are clearly defined as wives, while the rest appear to be temporary sexual mates. Two, Themis and Mnemosyne, are older than him, and belong to the previous generation. Five come from the same generation, and two of those are two of his elder sisters, Demeter and Hera. Two are younger; the one, Maia, one generation ahead, the other, Semele, two generations ahead. The last mate, Alcmena, is a mortal.

Poseidon, one of Zeus' two eldest brothers, mates once with the mortal Medusa, but lives together with the immortal Amphitrite.

Odysseus, a mortal man, has children with two goddesses living temporarily with them.

**Biological interpretation.** Zeus is the dominant male as it is shown by the several characteristics which are given to him: aegis-holder [Hes. *Th.* 11, 25, 52, 735, 920], great [81, 479, 708, 1002], wise [457, 545, 561], father of gods and men [457], who thunders on high [568, 601], far-seeing [884], Olympian [884], who drives the clouds [944], and showed all his strength [690–692]. He mates with several females both as wives or temporary sexual mates. Zeus is attracted to and chooses firstly wise, bright, and beautiful women of various ages and he has children who are bringers of spirit, enjoyment, brightness, happiness, beauty, wisdom, morality, and power or he attracts women by his strength and has glorious, joyous, and mighty children.

Poseidon the second dominant male (Earth-shaker [Hes. *Th.* 441, 456, 930], Earth-holder [15], Dark-haired [99, 278], loud-roaring [456, 930]) has children who are an armed male and a horse from the grim Gorgon Medusa, and the awful Triton from the Nereid Amphitrite. Poseidon, god of the sea, is involved in the generation of monsters originated from Pontus and Gaea.

Odysseus, the main figure of the *Odyssey*, during his trans-Mediterranean adventure, on his way back home after the Trojan war, has two productive love affairs. The names of the sons he had from the Oceanid Calypso, Nausithous and Nausinous, mean that both of them have to do with ship (naus-ναύς: ship). Telegonus literally means that which is begotten far off (tele-τῆλε: far off, gonos-γόνος: that which is begotten [LSJ, 1990]). Latinus is the hero of Latio in Italy (Grimal, 1976).

**Polyandry (Fig. 1).** *Gaea* (Earth) (I-2). «wide-bosomed, the ever-sure foundation of all» [Hes. *Th.* 117].

«she lay with **Uranus** (Heaven) (II-1) and bare» the twelve Titans, the three Cyclopes, and the three Hecatoncheires [Hes. *Th.* 133–152].

«And **Pontus** (Sea) (II-3) begat Nereus . . . and yet again he got great Thaumas and proud Phorcys, being mated with Gaea (Earth), and fair-cheeked Ceto and Eurybia who has a heart of flint within her» [Hes. *Th.* 233–239].

«But when Zeus had driven the Titans from heaven, huge Gaea (Earth) bare her youngest child Typhoeus of the love of **Tartarus** (I-3) by the aid of golden Aphrodite» [Hes. *Th.* 819–822].

*Aphrodite* (Cytherea) (III-22). «Cytherea bare to **Ares** (V-38) the shield-piercer Panic and Fear, terrible gods . . . and Harmonia» [Hes. *Th.* 933–937].

«And Cytherea with the beautiful crown was joined in sweet love with the hero **Anchises** (III-23) and bare Aeneas» [Hes. *Th.* 1008–1010].

*Eos* (Dawn) (IV-21). «bare to **Astraeus** (IV-15) the strong-hearted winds, brightening Zephyrus, and Boreas, headlong in his course, and Notus, a goddess mating in love with a god. And after these Erigeneia (Eos) bare the star Eosphorus (Dawn-bringer), and the gleaming stars with which heaven is crowned» [Hes. *Th.* 378–382].

«bare to **Tithonus** (IV-20) brazen-crested Memnon, king of the Ethiopians, and the Lord Emathion» [Hes. *Th.* 984–985].

«And to **Cephalus** (IV-22) she bare a splendid son, strong Phaethon, a man like the gods» [Hes. *Th.* 986–987].

*Demeter* (IV-27). «he (**Zeus**) (IV-31) came to the bed of all-nourishing Demeter, and she bare white-armed Persephone» [Hes. *Th.* 912–913].

«Demeter, bright goddess, was joined in sweet love with the hero **Iasion** (IV-26) . . . and bare Plutus, a kindly god who goes everywhere . . . , and him who finds him . . . he makes rich, bestowing great wealth upon him» [Hes. *Th.* 969–974].

*Echidna* (VI-15). «**Typhaon** (IV-40) the terrible, outrageous and lawless, was joined in love to her (Echidna), the maid with glancing eyes (who is half a nymph, and half again a huge snake). So she conceived and brought forth fierce offspring; . . . Orthus the hound . . . , Cerverus . . . the hound of Hades . . . , Hydra of Lerna . . . , Chimaera» [Hes. *Th.* 306–320].

«but Echidna was subject in love to **Orthus** (her son) (VII-9) and brought forth the deadly Sphinx . . . and the Nemean lion» [Hes. *Th.* 326–327].

**Comments.** Five females are polygamous. They seem to be dominant figures in the *Theogony*. Gaea is the first person from which all the others generated. Aphrodite is the goddess of fertility, although she does not have as many love affairs as would be expected. Demeter is «the all-nourishing», so she deserves more than one love union. Eos (Erigeneia, the Early-born) is a distinct goddess. She mates with another god, and with two mortal men. Echidna, half lovely maiden, half huge snake, is the main figure in the procreation of monsters, so she has two unions both exogamous and endogamous.

### Monogamy

Monogamy, the most common form of human sexual behaviour, is almost the rule in the *Theogony* after the III generation, except for the above mentioned polygamies.

**Consanguineous Mating (Fig. 1)**

«... she (**Gaea**, mother) (I-2) lay with **Uranus** (son) (II-1) and bare deep-swirling Oceanus, Coeus, and Crius and Hyperion and Iapetus, Theia and Rhea, Themis and Mnemosyne, and gold-crowned Phoebe and lovely Tethys. After them was born Cronos the wily, youngest and most terrible of her children, and he hated his lusty sire. And again, she bare the Cyclopes, ... And again, three other sons were born of Gaea and Uranus ... » the Hecatoncheires (hundred-handed) [Hes. *Th.* 132–156]. The description of the Cyclopes and Hecatoncheires is cited in Teratogony.

«And yet again he (**Pontus**, son) (II-3) got great Thaumás and proud Phorcys, being mated with **Gaea** (mother) (I-2), and fair-cheeked Ceto and Eurybia who has a heart of flint within her» [Hes. *Th.* 237–239].

«And **Tethys** (sister) (III-11) bare to **Oceanus** (brother) (III-1), eddying rivers, Nilus, and Alpheus, and deep-swirling Eridanus ... (Hesiod gives the names of 25 rivers). Also she brought forth a holy company of daughters who with the lord Apollo and the Rivers have youths in their keeping—to this charge Zeus appointed them—... and Electra and Doris, ... Clymene ... and Callirrhoe, ... and Idyia, ... Perseis ... Europa, Metis, and Erynome, ... and Asia and charming Calypso, ... and Styx who the chiefest of them all. These (fourty one, their names are given in the text) are the eldest daughters that sprang from Oceanus and Tethys; but there are many besides. For they are three thousand neat-ankled daughters of Oceanus who are dispersed far and wide, and in every place alike serve the earth and the deep waters, children who are glorious among goddesses. And as many other rivers are there, babbling as they flow, sons of Oceanus, whom queenly Tethys bare, but their names it is hard for a mortal man to tell, but people know those by which they severally dwell» [Hes. *Th.* 337–370].

«And **Theia** (sister) (III-6) was subject in love to **Hyperion** (brother) (III-4) and bare great Helios (Sun) and clear Selene (Moon) and Eos (Dawn) who shines upon all that are on earth and upon the deathless Gods who live in the wide heaven» [Hes. *Th.* 371–374].

«**Phoebe** (sister) (III-10) came to the desired embrace of **Coeus** (brother) (III-2) and through the love of the god conceived and brought forth dark-gowned Leto, always mild, kind to men and to the deathless gods, mild from the beginning, gentlest in all Olympus. Also she bare Asteria of happy name, whom Perses once led to his great house to be called his dear wife. And she conceived and bare Hecate whom Zeus the son of Cronos honoured above all» [Hes. *Th.* 404–412].

«**Rhea** (sister) (III-7) was subject in love to **Cronos** (brother) (III-12) and bare splendid children, Hestia, Demeter, and gold-shod Hera and strong Hades, pitiless in heart, who dwells under the earth, and the loud-crashing Earth-Shaker, and wise Zeus, father of gods and men, by whose thunder the wide earth is shaken» [Hes. *Th.* 453–458].

«**Ceto** (sister) (III-27) bare to **Phorcys** (brother) (III-26) the fair-cheeked Graiae, sisters grey from their birth: and both deathless gods and men who walk on earth call them Graiae, Pempredo well-clad, and saf-

ron-robed Enyo, and the Gorgons who dwell beyond glorious Ocean in the frontier land towards Night where are the clear-voiced Hesperides, Sthenno, and Euryale, and Medusa who suffered a woeful fate: she was mortal, but the two were undying and grew not old» [Hes. *Th.* 270–277].

«And Ceto was loined in love to Phorcys and bare her youngest, the awful snake who guards the apples all of gold in the secret places of the dark earth at its great bounds. This is the offspring of Ceto and Phorcys» [Hes. *Th.* 333–336].

«Lastly, he (**Zeus**, brother) (IV-31) made **Hera** (sister) (IV-28) his blooming wife: and she was joined in love with the king of gods and men, and brought forth Hebe and Ares and Eileithyia» [Hes. *Th.* 921–923].

«Also he (**Zeus**, brother) (IV-31) came to the bed of **Demeter** (sister) (IV-27) and she bare white armed Persephone whom Aidoneus carried off from her mother; but wise Zeus gave her to him» [Hes. *Th.* 912–914].

«but **Echidna** (mother) (VI-15) was subject in love to **Orthus** (son) (VII-9) and brought forth the deadly Sphinx which destroyed the Cadmeans, and the Nemean lion» [Hes. *Th.* 325–327].

**Comments.** Incestuous matings are common in the II and III generation, i.e., early in the cosmogony and *Theogony* (Fig. 1). While mother/son alliances of necessity dominate the II generation, and sister/brother unions are common in the III, exogamy increasingly becomes the norm [Clay, 1993]. The most striking exception is Zeus himself with his marriage to his sister Hera and his union with sister Demeter. Since all three are Olympians, i.e., the ruling family, it is reminiscent of endogamous marriages of royal families to keep the power within. Gaea's abnormal children from Uranus are discussed later as expressing dominant traits. The products of Ceto-sister/Phorcys-brother (III generation) union are abnormal; two of them, the Graiae, exhibit a clearly autosomal recessive trait, albinism, the Gorgons are by definition grim, and the last is a snake. Echidna's incestuous union with son in the VI generation does not seem to follow the whole genealogical schema of the *Theogony*: that is, the evolution of the cosmos from a relative lack of definition and differentiation to a successive higher level of differentiation and definition [Clay, 1993]. This is not the case with Echidna's monstrous progeny, so this endogamous union goes along with the abnormality of her progeny.

**Marriage or Union With No Offspring (Fig. 1)**

«But **Briareos** (III-17), beeing goodly, the deep-roaring Earth-Shaker made his son-in-law, giving him **Cymopolea** (V-40) his daughter to wed» [Hes. *Th.* 817–819].

«... and she (Demeter) bare white-armed **Persephone** (V-35) whom **Aidoneus** (Hades) (IV-29) carried off from her mother; but wise Zeus gave her to him» [Hes. *Th.* 912–913].

«And **Hephaestus** (V-36), the famous Lame one, made **Aglaea** (V-14), youngest of the Graces, his buxom wife» [Hes. *Th.* 945–946].

«And golden-haired **Dionysus** (VIII-1) made brown-haired **Ariadne** (VIII-2), the daughter of Minos, his



buxom wife: and the son of Cronos made her deathless and unageing for him» [Hes. *Th.* 947–948].

«And mighty **Heracles** (V-56), the valiant son of neat-ankled Alcmena, when he finished his grievous toils, made **Hebe** (V-37) the child of great Zeus and gold-shod Hera his shy wife in snowy Olympus. Happy he! For he has finished his great work and lives amongst the undying gods, untroubled and unaging all his days» [Hes. *Th.* 949–955].

«**Autonoe** (VII-7) whom long haired **Aristaeus** (VII-6) wedded . . . » [Hes. *Th.* 977].

**Comments.** Like in any human community, there are also here marriages with no offspring. The cause of that, if it is sterility, sterilization or end of reproductive period, is not stated by Hesiod. Briareos is one of the Hecatoncheires (hundred-handed). Aidoneus is the god of the nether world. Hephaestus is lame but his wife is the youngest of the Graces. From other sources [Grimal, 1976] it is known that Ariadne had four children with Dionysus. Heracles, demi-god, marries with the personification of youth Hebe and it is strange they do not have children. Aristaeus and Autonoe, as it is known from other sources [Grimal, 1976], did have a son.

#### Unusual Conception and Procreation of Children (Fig. 1)

«And **Uranus** (Heaven) (II-1) came, bringing on night and longing for love, and he lay about Gaea (Earth) spreading himself full upon her. Then the son (Cronos) from his ambush stretched forth his left hand and in his right took the great long sickle with jagged teeth, and swiftly lopped off his own father's members and cast them away to fall behind him. And not vainly did they fall from his hand; for all the **bloody drops** that gushed forth **Gaea** (I-2) **received**, and as the seasons moved round she **bare** the strong **Erinyes** (III-19) and the great **Giants** (III-20) with gleaming armour, . . . , and the **Nymphs** whom they call **Meliae** (III-21) all over the boundless earth» [Hes. *Th.* 176–187].

**Comments and interpretation.** Here, blood cells (somatic) serve as germ cells. It is clearly shown that Gaea received all the bloody drops and as the seasons moved round (pregnancy) she gave birth to several children. According to the story, Uranus by his castration becomes sterile; however he is still reproductive through his blood drops. Although Hesiod's *Theogony* passes over the creation of man [Burkert, 1985, p. 188], Clay [1988], has argued that the Giants in union with the Meliae nymphs are the ancestors of the human race. So they are not engendered through sexual union like the gods but through another second choice process.

It is not known whether a method of using somatic cells instead of sperm may be applicable for reproduction by sterile men in the future. A fundamental and still unsolved problem concerning the developmental process is whether differentiated somatic cells retain the genomic totipotency of the zygote nucleus. The results of relevant studies summarized by DiBerardino [1988] demonstrate that the genome of several differentiated somatic cell types displays multipotentiality. In particular, nuclear transplantations from several differentiated somatic cell types into amphibian oocytes and eggs revealed that

their genome contains the genes required for the development of prefeeding tadpoles. In addition, erythrocyte nuclei directed the formation of feeding tadpoles (independent organisms) that advanced to larval stages with hind limb buds. Thus, the genome of several differentiated somatic cell types can undergo widespread activation and specify a multiplicity of cell types. Although evidence for the genomic totipotency of differentiated somatic cells is still lacking, the genetic totipotency of at least some differentiated somatic cell types still remains a tenable hypothesis [DiBerardino, 1988].

«And so soon as he (Cronos) had cut off the (Uranus') **members** (genitals) with flint and cast them from the land into the surging sea, they were swept away over the main a long time: and a **white foam** spread around them from the immortal **flesh**, and **in it there grew a maiden**. First she drew near holy Cythera, and from there, afterwards, she came to sea-girt Cyprus, and came forth an awful (αἰδοῦν: having a claim to regard [LSJ, 1990]) and lovely goddess, and grass grew up about her beneath her shapely feet. Her gods and men call **Aphrodite** (III-22), and the foam-born goddess and rich-crowned **Cytherea**, because she grew amid the foam, and Cytherea because she reached Cythera, and **Cyprogenes** because she was born in billowy Cyprus, and **Philomedes** because she sprang from the members (μήδεα, genitals). And with her went Eros, and comely Himeros (Desire) followed her at her birth at the first and as she went into the assembly of the gods» [Hes. *Th.* 188–202].

**Comments and interpretation.** In neither of the myths which have been suggested as sources for Hesiod's story of Uranus castration is there any indication that Aphrodite, or an Oriental predecessor of Aphrodite, was born of Uranus' severed genitals [Sale, 1961]. Hesiod is the first who describes this as the basis for Aphrodite's birth. In Hesiod's myth she may well have been born by a more normal process. Aphrodite goes through a process of conception and growth in the white foam (semen) spread around the severed genitals. It is most likely that Hesiod sees here an expression of Aphrodite as a goddess of fertility. Besides, Eros (ερος, poetic form of ἐρως: love, desire) and Himeros (μερος: desire, love) were with Aphrodite from the beginning and at the time when she joined the gods, that is, the qualities they represent are a constant feature of her activity as a goddess. The effect of both is to stress the relationship between fertility and the act of love, in other words the sexual reproduction. Is this unusual conception and birth of Aphrodite in fact Hesiod's theory on the origin of fertilization?

One theory on the origin of fertilization holds that it occurred as an accidental fusion of two undersized spores, which turned out to be advantageous. The earliest form of sexual reproduction was probably isogamy (iso = same; gamy = gametes), in which the gametes appear identical. The first sexual reproduction among eukaryotes probably resembled that seen even today in organisms like *Ulothrix* [Arms and Camp, 1987, pp. 396–398]. The spermatozoa in Uranus' semen could represent the identical gametes and the Aphrodite's conception a result of isogamy. So, Hesiod presents us a

story of isogamy in which the identical gametes are Uranus' spermatozoa, which fuse to form a zygote. The zygote grows to a maiden in the white foam of his semen, and it takes quite a long time in the sea, from Cythera of South Pelloponese to Cyprus (pregnancy) to come forth the awful and lovely goddess Aphrodite, the foam-born.

After the biological interpretation, it is interesting to see how a famous scholar of the ancient Greek religion, W. Burkert [1985, p. 154], makes his comments upon the same event, i.e., Aphrodite's birth from the foam around Uranus severed genitals. «Depths more uncanny and disturbing are plumbed in the birth myth which Hesiod recounts . . . . Whereas in epic the formula daughter of Zeus is attached to Aphrodite . . . , in this account she is older (Fig. 1, III-22) than all the Olympian gods (Fig. 1, IV-25 to IV-31); at the very first cosmic differentiation, the separation of heaven and earth, the power of union also emerged. Aphrodite is thereby caught up in a tradition of cosmogonic speculation which continued to be richly exploited through Orpheus down to Parmenides and Empedocles: begetting and the mingling of love is what drives the world onwards.» These comments are in support of the biological interpretation.

#### Unusual Pregnancy and Birth

«Now Zeus (IV-31), king of gods, made Metis (μῆτις: wisdom, skill, craft [LSJ, 1990]) (IV-10) his wife first, and she was wisest among gods and mortal men. But **when she was about to bring forth** the goddess bright-eyed **Athene** (V-11), **Zeus** craftily deceived her with cunning words and **put her in his own belly**, as Gaea (Earth) and starry Uranus (Heaven) advised. For they advised him so, to the end that no other should hold royal sway over the eternal gods in place of Zeus; for very wise children were destined to be born of her, first the maiden bright-eyed Tritogeneia (Athene), equal to her father in strength and wise understanding; but afterwards she was to bear a son of overbearing spirit king of gods and men. But Zeus put her into his own belly first, that the goddess might devise for him both good and evil» [Hes. *Th.* 886–900]. **«But Zeus himself gave birth from his own head to bright-eyed Tritogeneia** (Athene) (V-11), the awful, the strife-stirring, the host-leader, the unwearying, the queen, who delights in tumults and wars and battles» [Hes. *Th.* 924–926].

And from another recension of lines 889–900 and 924–929 quoted by Chrisippus (in Galen) [Evelyn-White, 1959, footnote, p. 146]. («But **Zeus** . . . deceiving **Metis** (Thought) although she was full wise. But he seized her with his hands and put her in **his belly**, for fear that she might bring forth something stronger than his thunderbolt: therefore **did Zeus**, who sits on high and dwells in the aether, **swallow her down** suddenly. But she straightway **conceived Pallas Athene**: and **the father of men and gods gave her birth by way of his head** on the banks of river Triton. And she remained hidden beneath the inward parts of Zeus, even Metis, Athena's mother, worker of righteousness, who was wiser than gods and mortal men. There the

goddess (Athena) received that whereby she excelled in strength all the deathless ones who dwell in Olympus, she who made the host-scaring weapon of Athena. And with it (Zeus) gave her birth, arrayed in arms of war»).

**Comments.** Zeus is the biological father but he also serves as a kind of surrogate mother since he put the pregnant mother (Metis) in his belly and finally he gave Athena birth from his own head. The last event reminds cranium bifidum with encephalocele.

A cultural practice among primitive tribes has been the rituals of «man-childbed» (couvade), in which men wore special clothes, ate certain foods, and acted out a mock labor. Modern day phenomena of couvade have been documented widely, occurring at rates of 20 to 80% in the United States according to the citations and study of Schodt [1989]. The explanation, of couvade syndrome, however, is not well established. An historical account is offered through analysis of folklore, plays, and other European literature across centuries [Trethowan and Conlan, 1965].

Besides, the scientific possibilities of male pregnancy in humans, by means of the transplantation of a fertilized egg in the abdominal cavity against the omentum, are checked out by Teresi and McAuliffe [1985] in a series of interviews with specialists in gynecology, neuroendocrinology, in vitro fertilization, and fetal physiology. The importance of male pregnancy as a futuristic concern is raised by Hanmer [1987], as well.

Nevertheless, there is an example of male pregnancy in animals and that is in the fishes of the genus *Hippocampus* (seahorse), which occupy the outer edges of the sea grass meadow found in coastal waters worldwide. The species *H. hippocampus* lives in the Mediterranean sea. In seahorses the male, like all other male animals, produces sperm, and the female produces eggs. What sets seahorses apart is that the female deposits her eggs in a brood pouch on the male's tale. He alone nurtures the embryos, eventually releasing a string of miniature seahorses [Vincent, 1994]. Except for seahorses, in pipefishes the males have brood pouches, where they incubate the young [Arms and Camp, 1987, pp. 611–612]. The «pregnancy» of Zeus in the recension quoted by Chrysippus seems to bear similarities with the male pregnancy of the seahorse and pipefish.

«With her (Medusa) (IV-38) lay the Dark-haired One (Poseidon) (IV-30) in a soft meadow amid spring flowers. And when Perseus **cut off her (Medusa's) head**, **there sprang forth** great **Chrysaor** (V-60) and the horse **Pegasus** (V-61)» [Hes. *Th.* 278–281].

**Comments and interpretation.** This mode of birth, violent and unnatural, can be seen as a metaphor of the life history of Hydrozoa [Arms and Camp, 1987, p. 563]. The polyp and medusa body forms may be combined in many different ways in the Hydrozoa. Usually polyps, either alone or in colonies, are the feeding stage in the life history and reproduce asexually, giving rise to other polyps or medusas. The **medusa buds** and swims off (Perseus cut off her head) and then **reproduces sexually** (with her lay the Dark-haired One), **giving rise to a new polyp generation** (Chrysaor, Pegasus). Medusa's bizarre delivery reminds part of the life history of Hydrozoa.

### Multiple Conceptions and Births (Fig. 1)

«... — the Olympian Muses, daughters of Zeus (IV-31) the aegis-holder. Them in Pieria did Mnemosyne (Memory) (III-9), ... bear of union with the father, the son of Cronos, ... For **nine nights did wise Zeus lie with her, entering her holy bed** remote from the immortals. And when a year was passed and the seasons came around as the months waned, and many days were accomplished, **she bare nine daughters**, all of one mind, ... a little way from the top-most peak of snowy Olympus» [Hes. *Th.* 52–62]. «These things, then, the Muses sang who dwell on Olympus, nine daughters begotten by great Zeus, Cleio and Euterpe, Thaleia, Melpomene and Terpsichory, and Erato and Polymnia and Urania and Calliope (V-47 to V-55), who is the chiefest of them all» [Hes. *Th.* 75–79].

**Comments and interpretation.** Nine consecutive conceptions following one another after nine consecutive sexual intercourses are depicted, for nine nights Zeus lay with Mnemosyne. Then after a pregnancy of a year she bore nine daughters. It illustrates multiple ovulation, nine distinct conceptions, and the birth of novemuplets fraternal girls.

There have always been higher order multiple births considered a natural wonder. They were extremely rare in former times. Since 1980, and especially since 1984, the birth rate of quadruplets, quintuplets, and even sextuplets has been increasing dramatically, partially attributed to the higher proportion of mothers treated with drugs to induce ovulation, hence several ova may ripen at once [Grutzner-Konnecke et al., 1990; Imaizumi, 1990; Campbell, 1991].

### Multiple Siblings of the Same Sex With Common Mental and Physical Characteristics (Fig. 1)

«The **Cyclopes** overbearing in spirit, Brontes (III-13), and Steropes (III-14), and stubborn-hearted Arges (III-15), who gave Zeus the thunder and made the thunderbolt: in all else they were like gods, but one eye only was set in the midst of their foreheads. And they were surnamed Cyclopes (Orbed-eyed) because one orbed eye was set in their foreheads. Strength and might and craft were in their works» [Hes. *Th.* 139–146]. Sons of Gaea (I-2) and Uranus (II-1).

(The **Hecatoncheires**, hundred-handed) «... three other sons were born of Gaea and Uranus, great and doughty beyond telling, Cottus (III-16) and Briareos (III-17) and Gyes (III-18), presumptuous children. From their shoulders sprang an hundred arms, not to be approached, and each had fifty heads upon his shoulders on their strong limbs, and irresistible was the strength that was in their forms. For of all the children that were born of Gaea and Uranus, these were the most terrible, and they were hated by their own father from the first» [Hes. *Th.* 147–156].

The **Horae** (Hours) three: Eunomia (Order) (V-41), Dike (Justice) (V-42), and Eirene (Peace) (V-43), «who mind the works of mortal men» [Hes. *Th.* 902–903], daughters of Zeus (IV-31) and Themis (III-8).

The **Moerae** (Fates) three: Clotho (V-44), Lachesis (V-45), and Atropos (V-46), «who give mortal men evil and good to have» [Hes. *Th.* 905–906]. Daughters of Zeus (IV-31) and Themis (III-8).

The **Charites** (Graces) three: Euphrosyne (V-12), Thaleia (V-13), and Aglaea (V-14) «fair-cheeked, ... from whose eyes as they glanced flowed love that unnerves the limbs: and beautiful is their glance beneath their brows» [Hes. *Th.* 907, 910–911]. Daughters of Zeus (IV-31) and Eurynome (IV-11), daughter of Oceanus (III-1).

The **Muses** (V-47 to V-55) nine: «Cleio and Euterpe, Thaleia, Melpomene and Terpsichory and Erato and Polymnia and Urania and Calliope» [Hes. *Th.* 77–79], «the gold-crowned ... who delight in feasts and the pleasures of songs» [Hes. *Th.* 916–917]. Daughters of Zeus (IV-31) and Mnemosyne (III-9).

The **Harpies** two: Aello (Storm-swift) (V-58), and Ocypetes (Swift-flier) (V-59), «the long-haired, who on their swift wings keep pace with the blasts of the winds and the birds; for quick as time they dart along» [Hes. *Th.* 267–269]. Daughters of Thaumias (III-25) and Electra (IV-3).

The **Graiae** two: Pemphredo (IV-34) and Enyo (IV-35), «the fair-cheeked Graiae, sisters grey from their birth» [Hes. *Th.* 270], daughters of Phorcys (III-26) and Ceto (III-27).

The **Gorgons** three: Stheno (IV-36), Euryale (IV-37) and Medusa (IV-38). Medusa «was mortal but the two were undying and grew not old» [Hes. *Th.* 277]. Daughters of Phorcys (III-26) and Ceto (III-27).

The **Winds** three: Zephyrus (V-21), Boreas (V-22), and Notus (V-23), «the strong-hearted winds» [Hes. *Th.* 378]. Sons of Astraeus (IV-15) and Eos (IV-21).

**Apollo** (V-32) and **Artemis** (V-33) «children lovely above all the sons of Heaven» [Hes. *Th.* 918]. Children of Zeus (IV-31) and Leto (IV-23).

The **Nereides**, (Sea-nymphs) fifty: «passing lovely amongst goddesses» [Hes. *Th.* 240], «skilled in excellent crafts» [Hes. *Th.* 264]. Their names are given in Hes. *Th.* 243–264, many of their names express various qualities or aspects of the sea [Evelyn-White, 1959, footnote, p. 97]. Few are shown on the pedigree (V-1 to V-6). Daughters of Nereus (III-24) and Doris (IV-4).

**Rivers**, three thousand (IV-1) [Hes. *Th.* 367] «eddy-ing» [Hes. *Th.* 337], the names of 25 are given in Hes. *Th.* 338–345, «many other rivers are there, babbling as they flow, sons of Ocean, whom queenly Tethys bear, but their names it is hard for a mortal man to tell, but people know those by which they severally dwell» [Hes. *Th.* 367–370]. Sons of Oceanus (III-1) and Tethys (III-11).

**Oceaninai** (Oceanides, nymphs of lands and streams), three thousand (Hes. *Th.* 364), (IV-2 to IV-14, few of them are given individually on the pedigree) «a holy company of daughters who with the lord Apollo and the Rivers have youths in their keeping—to this charge Zeus appointed them» [Hes. *Th.* 346–348], «... there are three thousand neat-ankled daughters of Oceanus who are dispersed far and wide, and in every place alike serve the earth and the deep waters, children who are glorious among goddesses» [Hes. *Th.* 365–366].

The names of 40 are given in Hes. *Th.* 349–361, including Europe and Asia, Daughters of Oceanus (III-1) and Tethys (III-11).

Let's put a note about the physical status of Oceanus, the first of the Titans and Titanides born of Gaea and Uranus. In the *Theogony*, Oceanus is «the perfect river» [Hes. *Th.* 242, 959], who is also «great» [20],

«deep-swirling» [133] with his defined «springs» [282], «ford» [292], «streams» [788, 790, 841], and «branch» [789]. Oceanus is «back flowing» [776] and «with nine silver-swirling streams he winds about the earth and the sea's wide back, and then falls into the main; but the tenth flows out from a rock, a sore trouble to the gods» [790–792] [see also Garret, 1982].

**Comments and interpretation.** Although it is clearly shown that the nine Muses are fraternal novem-tuplets, this is not so for the others. However, since they are assigned not only individual but generic names defining common characteristics, it seems that the Harpies and the Graiae could be considered as twins; the Cyclopes, the Hecatoncheires, the Horae, the Moerae, the Charites, the Winds as triplets.

The Gorgons are three but while two of the sisters, Sthenno and Euryale, are immortal, Medusa is singled out as mortal. In case they are triplets, Medusa could be considered as having a mutation of the gene of immortality or a different father. Fraternal twins of different fathers have been documented by analysis of the HLA types [Terasaki et al., 1978], or cytogenetic markers [Verma et al., 1992] of the twins, their mother, and their putative fathers. It is worth mentioning here that Aristotle (384–322 B.C.) gives examples and an explanation for twins with different fathers. In his *History of Animals* [IX(VII), 585a13–17] he writes «... if the conception took place soon after, they have carried it to term as a superfetation and deliver them like twins from one seed, as in the myth of Iphicles and Heracles. For there has been actually the following evidence. An adulteress bore one child like her husband, the other like the adulterer.»

Heracles and Iphicles were sons of Alcmena born as twins, Heracles having been fathered by the god Zeus, Iphicles by her mortal husband Amphitryon, as we learn from Hesiod's *Shield of Heracles*. «So in one night Zeus shared the bed and love of the neat-ankled (Alcmena) daughter of Electryon and fulfilled his desire; and the same night Amphitryon, gatherer of the people, the glorious hero, came to his house when he had ended his great task... And all night long he lay with his modest wife, delighting in the gifts of golden Aphrodite. And she, being subject in love to a god and to a man exceeding goodly, brought forth twin sons in seven-gated Thebe. Though they were brothers, these were not of one spirit; for one was weaker but the other a far better man, one terrible and strong, the mighty Heracles. Him she bare through the embrace of the son of Cronos lord of dark clouds and the other, Iphicles, of Amphitryon the spear-wielder—offspring distinct, this one of union with a mortal man, but that other of union with Zeus, leader of all the gods» [Hes. Sc. 35–56].

Apollo and Artemis, although it is not made clear in the *Theogony*, are fraternal twins [Grimal, 1976].

For the 50 Nereides, and the 3,000 Oceanides and Rivers each group of which has one father and one mother, there are no reasonable biological comments. They belong to the sphere of imagination.

### Unusual Behaviour of Parents (Fig. 1)

«And again, **three other sons** were born of Gaea (Earth) (I-2) and Uranus (Heaven) (II-1), great and doughty beyond telling, Cottus (III-16) and Briareos (III-

17) and Gyes (III-18), presumptuous children. From their shoulders sprang an **hundred arms**, not to be approached, and each had **fifty heads** upon his shoulders on their strong limbs, and irresistible was the stubborn strength that was in their great forms. For of all the children that were born of Earth and Heaven, these were the most **terrible**, and they were **hated by their own father** from the first. And he used to **hide them** all away in a secret place of Earth so soon as each was born, and would **not suffer them to come up into the light**; and Heaven rejoiced in his evil doing» [Hes. Th. 147–158].

**Comments.** Uranus here appears to do what our modern society does by selective abortion of dysmorphic embryos. Since prenatal diagnosis was not available, Uranus hid the most terrible of his children which he hated from the first, as soon as each was born. Their birth hurt his narcissism.

«But Rhea (III-7) was subject in love to Cronos (III-12) and bare **splendid children**, Hestia (IV-25), Demeter (IV-27), and gold-shod Hera (IV-28) and strong Hades (IV-29, pitiless in heart, who dwells under the earth, and the loud-crashing Earth-Shaker (Poseidon) (IV-30), and wise Zeus (IV-31), father of gods and men, by whose thunder the wide earth is shaken. **These great Cronos swallowed as each came forth from the womb** to his mother's knees with this intent, that no other of the proud sons of Heaven should hold the kingly office amongst the deathless gods. . . . But when she (Rhea) was about to bear Zeus, . . . then she besought her own dear parents, Gaea (Earth) and starry Uranus (Heaven), to devise some plan with her that the birth of her dear child might be concealed, . . . So they sent her to Lyctus, to the rich land of Crete, when she was ready to bear great **Zeus**, the youngest of her children. Him did vast **Gaea receive** from Rhea in wide **Crete to nourish and to bring up . . . but to the mightily ruling son of Uranus (Cronos)**, the earlier king of the gods, **she gave a great stone** wrapped in swaddling cloths. Then **he took it in his hands and thrust it down into his belly**: wretch! he knew not in his heart that in place of the stone his son was left behind, unconquered and untroubled . . . After that, the strength and glorious limbs of the prince increased quickly, **and as the years rolled on**, great **Cronos** the wily was beguiled by the deep suggestions of Gaea, and **brought up again his offspring**, vanquished by the arts and might of his own son, **and he vomited up first the stone which he had swallowed last**. And Zeus set it fast in the wide-pathed earth at goodly Pytho under the glens of Parnassus, to be a sign thenceforth and a marvel to mortal men» [Hes. Th. 453–500].

**Comments and interpretation.** There are animals which swallow and then vomit alive their offspring. A male frog of the genus *Rhinoderma* carries the developing young in his vocal pouch, and the female *Rheobatrachus* carries the tadpoles in her stomach (the tadpoles release a hormone that inhibits secretion of stomach acid, thereby protecting themselves from digestion) [Arms and Camp, 1987, p. 614].

### Teratogony, Teratomorphic Offspring (Fig. 1 and 3)

Gaea (Earth) (I-2) «she lay with Ouranus (Heaven)» (II-1) [Hes. Th. 133] . . . «and again, she bare the **Cy-**

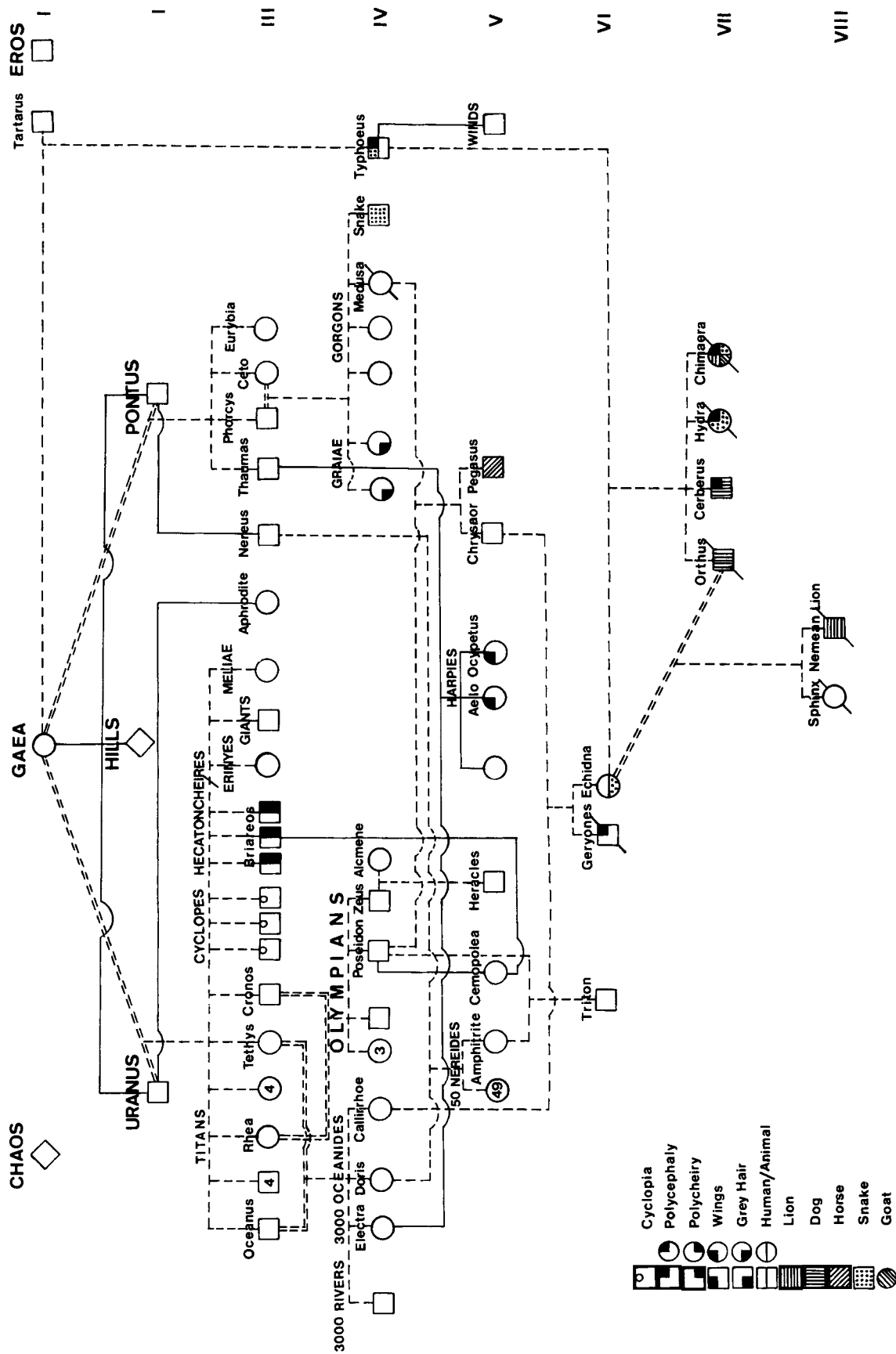


Fig. 3. Abbreviated Gaea's pedigree. Teratomorphic offspring. Note: sex symbols to anthropomorphic divinities and other creatures are given according to the gender (masculine, feminine, or neuter) of the names in the Greek language.

**clopes**, overbearing in spirit, Brontes (Thunderer) (III-13), and Steropes (Lightener) (III-14) and stubborn-hearted Arges (the Vivid One) (III-15), who gave Zeus the thunder and made the thunderbolt: in all else they were like the gods, but one eye only was set in the midst of their foreheads. And they were surnamed Cyclopes (Orb-eyed) **because one orbed eye was set in their foreheads**. Strength and might and craft were in their works» [Hes. *Th.* 139–146].

**Comments.** Ideas about one-eyed people have been found in many lands throughout the ages. Although many of these myths are quite fanciful, it seems reasonable to assume that observation of cyclopic infants and perhaps of cyclopic animals may have left vivid impressions that underwent mythical transformation. The occasional newborn of a diabetic mother can have both cyclopia and macrostomia, conditions that may have served as the basis for the mythical cyclopic giant [Cohen and Sulic, 1992]. In the *Theogony* Cyclopes are craftsmen making Zeus armament. Their cyclopia seems nonsyndromic but predicts alobar holoprosencephaly of the brain. Such infants function at the brain stem level [Barr and Cohen, 1991]. According to Kallen et al. [1992], infants with cyclopia are born at an approximate rate of 1 in 100,000 births; about 30% are stillbirths and 70% livebirths but die shortly after birth.

«And again, three other **sons** were born of Gaea and Uranus, great and doughty beyond telling, Cottus (III-16) and Briareos (III-17) and Gyes (III-18), presumptuous children. From their shoulders sprang an **hundred arms**, not to be approached, and each **had fifty heads** upon his shoulders on their strong limbs, and irresistible was the stubborn strength that was in their great forms. For of all the children that were born of Gaea (Earth) and Uranus (Heaven), these were the most terrible, and they were hated by their own father from the first. And he used to hide them all away in a secret place of Earth so soon as each was born, and would not suffer them to come up into the light; and Heaven rejoiced in his evil doing» [Hes. *Th.* 147–158].

«But when first their father was vexed in his heart with Obriareus and Cottus and Gyes, he bound them in cruel bonds, because he was jealous of their exceeding manhood and comeliness and great size; and he made them live beneath the wide-pathed earth, where they were afflicted, being set to dwell under the ground, at the end of the earth, at its great borders, in bitter anguish for a long time and with great grief at heart. But the son of Cronos (Zeus) and the other deathless gods whom rich-haired Rhea bare from union with Cronos, brought them up again to the light at Gaea's (Earth) advising. For she herself recounted all things to the gods fully, how that with these they would gain victory and a glorious cause to vaunt themselves . . . For the Titan gods and as many as sprung from Cronos had long been fighting together in stubborn war (Titanomachia) with heart-grieving toil, . . . But when he (Zeus) had provided those with all things fitting, nectar and ambrosia which the gods themselves eat, and when their proud spirit revived within them . . . » [Hes. *Th.* 617–641].

«And amongst the foremost Cottus and Briareos and Gyes insatiate for war raised fierce fighting: three hun-

dred rocks, one upon another, they launched from their strong hands and overshadowed the Titans with their missiles, and hurled them beneath the wide-pathed earth, and bound them in bitter chains when they had conquered them by their strength for all their spirit, as far beneath the earth as heaven is above earth; for so far is it from earth to Tartarus . . . There Gyes and Cottus and great-souled Obriareus live, trusty warders of Zeus who holds the aegis» [Hes. *Th.* 713–735].

«But the glorious allies of loud-crashing Zeus have their dwelling upon Ocean's foundations, even Cottus and Gyes; but Briareos, being goodly, the deep-roaring Earth-Shaker (Poseidon) made his son-in-law, giving him Cymopolea his daughter to wed» [Hes. *Th.* 815–819].

**Comments and interpretation.** The Hecatoncheires, each with an hundred hands and fifty heads could illustrate conjoined identical quinquagintuplex-fiftytuplets (pentecontacephalus, hecatontabrachius, hecatoncheirus, ileothoracopagus, dipus). What a mythical transformation! Usually conjoined identical twins are born (see Geryones).

But let us pay attention to the attitude of the other members of the «society» towards them and their contribution to the «society» through the quotations from the *Theogony*. The Hecatoncheires (conjoined fiftytuplets) are firstly rejected by their father because of their dysmorphism, but also because of jealousy for their physical and psychical charismata. But after two generations their mother convinces the leader of the society that they might be useful. So they are proven to be. Finally, they survive and function within the society. In our modern society polycephalic and multiple-armed individuals are destined not to live. Should we reconsider our attitude towards them? The *Theogony's* society sounds more humane than ours.

«But when Zeus had driven the Titans from heaven huge Gaea (I-2) bare her youngest child **Typhoeus** (IV-40) of the love of Tartarus (I-3), by the aid of golden Aphrodite. Strength was with his hands in all that he did and the feet of the strong god were untiring. From his shoulders grew an **hundred heads of a snake**, a fearful dragon, with dark, flickering tongues, and from under the brows of his eyes in his marvelous heads flashed fire, and fire burned from his heads as he glared. And there were **voices** in all his dreadful heads which uttered **every kind of sound** unspeakable; for at one time they made sounds such that gods understood, but at another, the noise of a bull bellowing aloud in proud ungovernable fury; and at another, the sound of a lion, relentless of heart; and at another, sounds like whelps, wonderful to hear; and again, at another he would hiss, so that the high mountains re-echoed» [Hes. *Th.* 820–835].

«So when Zeus had raised up his might and seized his arms, thunder and lightning and lurid thunderbolt, he leaped from Olympus and struck him, and burned all the marvellous heads of the monster about him. But when Zeus had conquered and lashed him with strokes, Typhoeus was hurled down, a maimed wreck, so that the huge earth groaned» [Hes. *Th.* 853–858].

«And in the bitterness of his anger Zeus cast him into wide Tartarus» [Hes. *Th.* 868].

**Comments.** It seems like Typhoeus was a man with an hundred heads of snake with voices of several animals. He appears as a chimeric creature.

«And of Amphitrite (V-2) and the loud-roaring Earth-Shaker (Poseidon) (IV-30) was born great, wide-ruling **Triton** (VI-4), and he owns the depths of the sea, living with his dear mother and the lord his father in their golden house, **an awful god**» [Hes. *Th.* 930–933].

**Comments and interpretation.** Triton is not described by Hesiod but is generally imagined as a combination of man and fish [Grimal, 1976], a chimeric creature.

«Thaumas (III-25) wedded Electra (IV-3) the daughter of deep-flowing Ocean, and she bare him swift Iris and the long-haired **Harpies**, **Aello** (Storm-swift) (V-58) and **Ocypetes** (Swift-flier) (V-59) who on their swift **wings** keep pace with the blasts of the winds and the birds; for quick as time they dart along» [Hes. *Th.* 265–69].

**Comments and interpretation.** Phocomelia of the upper limbs with polydactyly could be used as a model for Harpies in case they had only wings and no arms [Larsen, 1993, p. 298, Fig. 11–17; Warkany, 1971, p. 794, Fig. 85–1].

«Ceto (III-27) bare to Phorcys (III-26) the fair-cheeked **Graiae**, **sisters grey from their birth**: and both deathless gods and men who walk on earth call them **Graiae** (old women), **Pemphredo** (IV-34) well-clad, and saffron robed **Enyo** (IV-35)» [Hes. *Th.* 270–273].

**Comments and interpretation.** The Graiae should have tyrosinase negative oculocutaneous albinism. «At birth, the hair is snow white, the skin milky white and the irides bleu» [King and Summers, 1988]. Hesiod ignores their most notorious characteristic, their sharing of an eye and a tooth [Grimal, 1976], but emphasizes rather their albino phenotype.

Ceto (III-27) bare to Phorcys (III-26) «and the **Gorgons** who dwell beyond glorious Ocean in the frontier land towards Night where are the clear-voiced Hesperides, **Sthenno** (IV-36), and **Euryale** (IV-37), and **Medusa** (IV-38) who suffered a woeful fate: she (Medusa) was mortal, but the two were undying and grew not old. With her (Medusa) (IV-38) lay the Dark-haired One (Poseidon) (IV-30) in a soft meadow amid spring flowers. And when Perseus cut off her head, there sprang forth great Chrysaor and the **horse Pegasus** (V-61)» [Hes. *Th.* 274–281].

**Comments.** Hesiod does not describe the appearance of the Gorgons, who, nevertheless, are by definition grim. The epithet Gorgon [Γοργώ the Gorgon, i.e., the Grim One (cf. γοργος) (LSJ, 1990)] is mainly applied to Medusa, described with snakes for hair, whose look turned the beholder into stone [Grimal, 1976; Little et al., 1967]. Hesiod avoids to give any individual description of Medusa's appearance. Otherwise, how could he explain that Poseidon lay with her. Their union in a idyllic scene masks the incongruous and the grotesque [Clay, 1993].

**Biologic interpretation.** The story of the Gorgons reminds the life history of the class Hydrozoa and,

metaphorically, the individual characteristics, based on the Greek meaning of the names of the Gorgons, of the several body forms of a colonial member [Arms and Camp, 1987, Figs. 28-9, 28-8, p. 562]. The different individuals in the colony are specialized for different functions. There are the **defensive polyp**, which corresponds to Gorgon **Sthenno** (σθένος: strength, might, esp. bodily strength), the **reproductive polyp**, which corresponds to Gorgon **Euryale** (εuryάλος: with wide threshing-floors), as a reproductive polyp looks with the medusae (wide threshing-floors) developing on it. There is also a feeding polyp. The polyps are fixed and constitute the colony. A transparent chitin covers of the whole colony, so «they (Sthenno and Euryale) were undying and grew not old»; medusa has marginal tentacles and Medusa has snakes for hair; **medusa** buds off (Perseus cut off **Medusa's** head) from reproductive polyp and swims away, develops gonads, and then releases egg or sperm; fertilized egg (with Medusa lay Poseidon) develops into a ciliated planula larva (there sprang forth Chrysaor and Pegasus). Medusa is mortal, dies at the time of delivery; the scyphozoan medusa *Aurelia* dies after sexual reproduction. The planula larva settles in a suitable place and buds to give rise to a new colony. The Hydrozoan polyps are feeding at night (the Gorgons «dwell beyond glorious Ocean in the frontier land towards Night»).

«With her (Medusa) (IV-38) lay the Dark-haired One (Poseidon) (IV-30) in a soft meadow amid spring flowers. And when Perseus **cut off her (Medusa's) head**, **there sprang forth** great **Chrysaor** (V-60) and the horse **Pegasus** (V-61) who is so called because he was born near the springs (*pegae*) of Oceanus; and that other because he held a golden blade (*aor*) in his hands. Now Pegasus flew away and left the earth, the mother of flocks, and came to the deathless gods: and he dwells in the house of Zeus and brings to wise Zeus the thunder and lighting» [Hes. *Th.* 278–286].

**Comment.** Medusa's child and Gereones father, Chrysaor, does not seem particularly monstrous. His one distinctive feature is his golden sword with which, apparently, he is born. This armed birth is likewise evocative of the Giants who were engendered along with the Melian nymphs, from the bloody drops of Uranus' castrated members [Hes. *Th.* 183–187; Clay, 1993]. Clay [1988] has argued that these Giants in union with the Meliae are the ancestors of the human race. If this is so, one could suggest that Chrysaor, mighty and armed like the Giants, and who also unites with a nymph, the Oceanid Callirrhoe, represents an alternative progenitor to an alternative race of mortals. That race, however, is short lived [Clay, 1993].

For Pegasus' (horse) birth from the severed Medusa's neck there is no rational explanation; it belongs to the sphere of imagination.

«But Chrysaor (V-60) was joined in love to Callirrhoe (IV-6), the daughter of glorious Ocean, and begot **three-headed Geryones** (VI-14). Him mighty Heracles (V-56) slew in sea-girt Erythea by his shambling oxen on that day when he drove the wide-browed oxen to holy Tiryns, and had crossed the ford of Ocean and killed Orthus and Eurytion the herdsman in the



dim stead out beyond gloriſ Ocean» [Hes. *Th.* 287–294].

«And the daughter of Oceanus, Callirrhoe was joined in the love of rich Aphrodite with stout hearted Chrysaor and bare a son who was **the strongest of all men, Geryones**, whom mighty Heracles killed in seagirt Erythea for the sake of his shambling oxen» [Hes. *Th.* 979–983].

**Comments and interpretation.** Geryones is a strong tricephalus man. Heracles killed him not because of his monstrosity, but to take his oxen. With him he also killed Orthus, his hound, and the herdsman. Hesiod only mentions Geryones' three heads (tricephalus). Based on these data we could assume that Geryones was tricephalus, ileothoracopagus, dibrachius, dipus, formed by conjoined identical triplets. On ancient ceramic paintings, however, he is illustrated as tricephalus, sixbrachius, ileothoracopagus, dipus. Human dicephalus formed by conjoined twins do occur. Conjoined twins, ileothoracopagus tetrabrachius tripus are illustrated in Warkany [1971, p. 631] reproduced from E. Hollander, 1922. In Kunze and Nippert [1986] several dicephalus ileothoracopagus tetrabrachius either dipus or tetrapus conjoined twins are illustrated, covering a period of time from Neolithicum 6500 B.C., 8th century B.C., 500 B.C.–800 A.D. pre-Columbian art, to 1512, and 1894 A.D.

Conjoined twins are believed to be monozygotic produced by an incomplete fission of the original embryo occurring probably during the third week [Siebert et al., 1989], although there is evidence to support fusion between embryos in all cases [Spencer, 1992]. A dicephaly may be caused by a splitting of the head process with two cranial body parts developing. The prevalence of conjoined twins at birth, estimated by the International Clearinghouse for Birth Defects Monitoring Systems [1991] is around 1.3 per 100,000 births. Among the 312 cases of conjoined twins, 44 were dicephalus, and 4 dicephalus tri/tetrabrachius. In at least nine cases, the conjoined twins had a normal «triplet». However, a case of tricephalus has been cited by Wilder [1908, p. 357, footnote 2].

«... and in a cave she bare another monster irresistible, in no wise like either to mortal men or to the undying gods, even the goddess fierce **Echidna** (VI-15) who is **half nymph** with glancing eyes and fair cheeks, and **half again a huge snake** (πέλωρον ὄφιν) great and awfull with **speckled skin**, eating raw flesh beneath the secret parts of the holy earth. And there she has a cave deep down under a hollow rock far from the deathless gods and mortal men. There, then, did the gods appoint her a glorious house to dwell in: and she keeps guard in Arima beneath the earth, grim Echidna who dies not nor grows old all her days» [Hes. *Th.* 295–305].

**Comments.** Echidna, does she illustrate sirenomelia with Ichthyosis Hystrix, which is rare but striking malformation of the skin? The lesions are wart-like growths with horny tops, brown or black in color. The face, the palms and soles usually are not affected. In rare instances, the condition is generalized and results in a picture often compared to the skin of animals. Such patients' skin has been described as resembling the pelt of

a seal, the hide of an elephant or the quills of a hedgehog [Warkany, 1971, p. 1160]. If not so, then she might be an imaginary heterologous chimera: woman/male snake (snake = ὄφις, masculine in Greek). Although she is half maiden and half male snake, she has a feminine name; the female dominates. Could her animal half be interpreted as a topographically limited somatic mutation?

«Men say that Typhaon (IV-40) the terrible, outrageous and lawless, was joined in love to her (Echidna) (VI-15), the maid with glancing eyes. So she conceived and brought forth fierce offspring; first she bare **Orthus** (VII-9) the **hound** of Geryones» [Hes. *Th.* 306–309].

«and then again she (Echidna) bare a second **monster** not to be overcome and that may not be described, **Cerberus** (VII-10) who eats raw flesh, the **brazen-voiced hound** of Hades, **fifty-headed**, relentless and strong» [Hes. *Th.* 310–312].

«There, in front, stand the echoing halls of the god of the lower-world, strong Hades, and of awful (επαινης) Persephone. A **fearful hound** guards the house in front, and he has a cruel trick. On those who go in the fawns with his tail and both his ears, but suffers them not to go out back again, but keeps watch and devours whomsoever he catches going out of the gates» [Hes. *Th.* 767–773].

**Comments and interpretation.** Orthus appears as a normal dog. Cerberus with his fifty heads could represent imaginary conjoined identical fiftytuplets dogs.

«And again she (Echidna) bore a third, the evil-minded **Hydra of Lerna** (VII-11), whom the goddess, white-armed Hera nourished, being angry with mighty Heracles (V-56). And her Heracles, the son of Zeus, of the house of Amphitryon, together with warlike Iolaos, destroyed with the unpyting sword through the plans of Athene the spoil-driver» [Hes. *Th.* 313–318].

**Comments and interpretation.** *Hydra*, a solitary, freshwater member of the class Hydrozoa, is a commonly studied invertebrate carnivore animal, which produces new individuals asexually by budding. When the bud is large enough, it breaks off and starts an independent life. *Hydrae* capture surprisingly large prey animals, and spend a long time digesting them before the next meal [Arms and Camp, 1987, pp. 392, 563].

Hesiod's Hydra of Lerna is a magnification of the natural *Hydra*. *Hydrae*, probably, were a real threat to the life of the Lernean lagoon. Heracles as a demi-god probably represents either a real man or a group of men («with . . . Iolaos»), who managed to destroy or control the overproduction of *Hydrae* in the lake.

«She (Echidna? Hydra?) was the mother of **Chimaera** (VII-12) who breathed raging fire, a creature fearful, great, swift-footed and strong, who had **three heads**, one of a grim-eyed lion, another of a **goat**, and another of a **snake**, a fierce dragon; in her **forepart** she was a **lion**; in her **hinderpart**, a **dragon**; and in her **middle**, a **goat**, breathing forth a fearful blast of blazing fire. Her did Pegasus (V-61) and noble Bellerephon slay;» [Hes. *Th.* 319–325].

**Comments and interpretation.** In the *Theogony*, Chimaera is an animal with the head of a lion, the body



of a goat and the tail of a dragon. Perhaps, she does not designate an absolutely unreal creature. In genetics, the term is used more prosaically to refer to an individual with at least two different cell lines of genetically different origin (thus differing from a mosaic, in which the different cell lines originate from the same zygote). Liveborn interspecies chimeras between goats and sheep have now been produced [Fehilly et al., 1984; Meinecke-Tillmann and Meinecke, 1984; Jaszczak et al., 1991]. Dispermic chimeras are thought to develop from fusion of fraternal twin zygotes in very early development. Separate fertilization of the egg and of a polar body is one of several other suggested mechanisms. If a dispermic chimera has developed from fused XX and XY zygotes, true hermaphroditism usually results. Indeed, the very first case to be described was found after a deliberate search for a true hermaphrodite with different-colored eyes. She was a girl, with an average of equal numbers of cells with XX and XY karyotypes [Gartler et al., 1962]. The term «chimera» is defined as an organism whose body contains different cell populations derived from different zygotes of the same or different species, occurring spontaneously or produced artificially [Dorland's Medical Dictionary, 1968]. The mythological Chimaera could represent a heterologous chimera since the foreign body parts are derived from organisms of different species.

«but Echidna was subject in love to Orthus (her son) and brought forth the deadly **Sphinx** (VIII-3) which destroyed the Cadmeans, and the **Nemean lion** (VIII-4), which Hera, the good wife of Zeus, brought up and made to haunt the hills of Nemea, a plague to men. There he preyed upon the tribes of her own people and had power over Tretus of Nemea and Apesas; yet the strenght of stout Heracles (V-56) overcame him» [Hes. *Th.* 326–332].

**Comments.** Echidna, half woman and half snake, bore, after an incestuous mating with a dog, a lion and the Sphinx; no comments. Sphinx is not described by Hesiod but is generally imagined as a combination of woman and lion having wings as well [Grimal, 1976]. Thus, she could represent an heterologous chimera.

«And Ceto was joined in love to Phorcys and bare her youngest, the **awful snake** (IV-39) who guards the apples all of gold in the secret places of the dark earth at its great bounds. This is the offspring of Ceto and Phorcys» [Hes. *Th.* 333–336].

**Comment.** This birth of a snake by the anthropomorphic Ceto seems nonsensical to us if we accept it in its literal translation. It is an event that do not seem compatible with rational modern concepts.

## DISCUSSION

Hesiod's perception pertaining to cosmogony and isogamy coincide with modern theories on the origin of life and of fertilization respectively. For other events that he describes 3,000 years ago such as multiple conceptions, twins of different fathers, and animal chimerism, we have got the biological answers just few decades ago.

For some events, such as blood cell intervention to conception, we do not have the answer yet. One could dare say that today's scientific knowledge is not suffi-

cient to interpret all of Hesiod's invention and still, why not, innovation. Perhaps, in the years to come, more of the *Theogony's* mythos will be proven to be logos.

The description of teratoids in the *Theogony* reflects early knowledge of dysmorphology. Rarities such as double-headed conjoined twins, cyclopia or other congenital malformations and genetic diseases, seem to have served as prototypes of immortal or mortal teratomorphic individuals. Some of the teratoids or part of their description can be recognized as congenital malformations as we know them today. Others seem nonsensical if we accept them in their literal translation. Births by anthropomorphic female entities of snakes, horses, or other animals, do not seem compatible with rational modern concepts. Entities such as crosses of human and terrestrial beings are produced in the *Theogony*, but only after the union of anthropomorphic entities. There is no union between anthropomorphic entity and animal in the *Theogony*, suggesting that fertility between human and animal was not considered possible.

Hesiod's descriptions are of outstanding importance because they were written down, and give us the opportunity to study all of his teratoids, no matter whether some of them appear at first glance irrational. So, let us study the abbreviated Gaea's pedigree (Fig. 3), giving emphasis to the teratogenesis.

First of all, Gaea is described as πελώρη [Hes. *Th.* 159, 173, 821], not πελώρια that could simply mean «vast» as it is interpreted [159, 173] by Evelyn-White [1959]. This becomes clear if we see that in the Greek text the term πελώριον is used to describe the «great long sickle» [Hes. *Th.* 179], by which Cronos castrated his father Uranus. In addition, Hesiod uses the adjective πέλωρος, and in the case of Echidna who is generally described as πέλωρον ἀμήχανον [Hes. *Th.* 295] and also her animal half-part ἡμισυ δ' αὐτε πέλωρον ὄφιν δεινόν τε μέγαν τε [Hes. *Th.* 299]. The adjective πέλωρος, η, ον (all three gender forms) has the meaning of monstrous, prodigious, huge with collateral notion of terrible [LSJ, 1990]. So, Gaea πελώρη, the progenitor of all the beings listed in the pedigree, is monstrous, prodigious, huge. Her teratogenic traits are expressed in her children from union of both, with her son Uranus (Cyclopes, Hecatoncheires) and with Tartarus (Typhoeus). We can assume these traits as dominant.

But most of the monsters belong to the descendants of her union with her son Pontus. However, Nereus, whom Pontus begot himself, and Thaumás, Phorcys, Ceto, Eurybia, the children of Pontus and Gaea are described as normal [Hes. *Th.* 233–239]. The abnormalities are expressed after the incestuous union of Phorcys and Ceto. In fact, the Graiae are grey from birth. This is a characteristic of the autosomal recessive tyrosinase negative albinism. The Gorgons by definition are grim and the last-born is a snake. It seems, then, that like Gaea is passing her recessive genes to her progeny from Pontus. But Gaea's and Uranus grand daughters Oceanides, products of the incestuous union of Oceanus and Tethys, should also carry recessive genes. From the Oceanid Electra and the Pontides Thaumás the Harpies, who have wings, are born.

The Cronides-Olympians are also products of incestuous brother-sister union. All seem perfectly normal.

In fact, they generate individuals of the harmonious establishment of the world. But among them Poseidon exhibits abnormal behaviour. He mates with the grim Gorgon Medusa; he gives his daughter Cernopolea wife to the Hecatoncheir Briareos. In addition, he gets abnormal children from both of his matings: with the Nereid Amphitrite (Triton) and with Medusa (horse Pegasus and Chrysaor). Chrysaor sounds normal, but from his mating with the Oceanid Callirrhoe abnormal children are born: the tricephalus Geryones, who could represent conjoined triplets, and the nymph/snake Echidna. Geryones is the last man that appears in the pedigree of monsters.

After Echidna's mating with Typhoeus, animal features and abnormal traits are mainly expressed. Hesiod does not even describe the human/leonine Sphinx. Let us see the «phenotype» and assume the «genotype» of Echidna and Typhoeus. Echidna (ἐχιδνα, feminine) is half lovely maid and half masculine snake (ὄφις), but the female element dominates on the phenotype. Typhoeus is described as a strong male god having strong hands and untiring feet (of a man?), a hundred heads of a snake growing from his shoulders, which uttered every kind of sound, including that of a lion and of dogs. Thus we could explain the birth of the dogs Orthus and Cerberus, of the Nemean lion, of the Hydra, and the leonine and snake parts of Chimaera. The she-goat part of the latter appears for the first time in an individual of the pedigree. Could it represent a new, somatic mutation? In Chimaera, as in Echidna, it is the feminine that dominates over the masculine lion (λεων) and snake (ὄφις), and gives the name to her (χιμαίρα: she-goat). Polycephaly, inherited from Typhoeus, is expressed in male and female members of his clan, namely, Cerberus, Hydra, and Chimaera, as an autosomal dominant trait.

There are questions though [Clay, 1993] about who is the mother of Chimaera and who mates with Orthus. This is because Hesiod uses pronouns in those two instances [Hes. *Th.* 319, 326] instead of names, while, later in the text, he clearly gives the names of the parents of the snake. Scholars have proposed any possible candidate for these two female individuals [Clay, 1993]. Constructing the pedigree, I put the members in the order that are given in the text. From a genetic point of view, I think that Echidna is the mother of Chimaera and Typhoeus her father. Typhoeus is genetically polydynamous. He possesses many traits that he could transmit to Chimaera. On the contrary, Hydra segregates only the snake traits. So she cannot be the mother of the compound Chimaera. At any rate, the problem is not who is the mother of whom. In the last two generations (VII and VIII) of the monsters the «bad genes» are expressed and only animals, simple or chimeric, with abnormalities are produced.

But, let us see the fate of the teratomorphics relevantly to their abnormality. There is one group with «congenital malformations and genetic disease». In this group are classified:

The Cyclopes (cyclopia) are craftsmen, produce the weapons that allow Zeus to maintain power.

The Hecatoncheires (conjoined fiftytuplets) keep guard over the defeated Titans.

The Harpies on their wings keep pace with the blasts of the winds and the birds.

The Graiae (albinism): it is not defined what they are doing, but nothing wrong happens to them.

The tricephalus Geryones (conjoined triplets), owner of a special kind of oxen, is slain by Heracles for the sake of his oxen, not because of his abnormality.

Cerberus (conjoined fiftytuplet dogs) receives a place and function in the organization of the under-world.

There is a group of animals, which are not a threat to the inhabited world:

Orthus, the hound of Geryones, is killed by Heracles when he drove the oxen to Tiryns, not because of any abnormality.

Pegasus, a horse, is integrated into Zeus' realm and brings to Zeus the weapons. In addition, he participates in the annihilation of Chimaera.

The Snake guards the golden apples in the secret places of the dark earth at its great bounds.

There is a group of dangerous animals in the inhabited world:

The Hydra of Lerna, a carnivore water-snake erupting in the Lernean marsh, is destroyed by Heracles and Iolaos.

The Nemean lion, a plague to men of Nemea, is overcome by Heracles.

There is a group of chimeric creatures:

Typhoeus, with human(?) features and features of several animals, is neutralized and cast into wide Tartarus (depths of the earth) by Zeus.

Echidna, half human-half snake, is born in a cave, mates under the earth with Typhoeus, and, finally, she keeps guard in Arima beneath the earth.

Chimaera, an heterologous chimera, is slain by Pegasus and Bellerephon.

Some creatures are unclassified:

The Gorgons, a metaphor of the body forms of Hydrozoa, dwell beyond the ocean. Medusa (jelly-fish), the motile body form of Hydrozoa, dangerous to the swimmers, is decapitated by Perseus.

If we analyze the abnormality and the relevant function and fate of the individuals of the different groups we see that those with congenital malformations do survive and function in the «society»; so do the harmless animals. The dangerous animals are destroyed; the monstrous, chimeric creatures are either neutralized and put beneath the earth or are annihilated.

But the main question is whether such monsters can be produced. Hesiod says that they can be and should be slain, unless they are useful to the society, or are eliminated in a way that cannot cause harm. What do we think about these today? By the advanced genetic technology on rDNA and the ability to manipulate the genome, fears are brought forward that fierce and dangerous, not controlled, monsters could be created because of curiosity or madness of scientists [Nippert, 1986; Ringel, 1989; Annas, 1990]. Apparently the figure of the «mad genetic experimenter» has power to terrify scientists and lay people alike. Lurking behind the cells in the Petri dishes is the image of animal and human in unholy combination: the Beast [Ringel, 1989].

«Genetic engineering has become one of the most fascinating topics of late 20th century science. The social implications inherent in this new technique, that surpasses the potential for diagnosis, treatment, or even cure of genetic diseases, are quite unknown and have generated plenty of controversy. The objections range from the reasoned to the absurd, from ethical concerns regarding the abortion of children with genetic diseases to those who fear that the scientists «tinkering» with and probing within the nucleus of the cell will inevitably lead to the creation of manmade monsters—Fashioning new kinds of people or «freaks of man» by tampering with the genesis is probably the least likely outcome of the new research. But only in an utopian society all applications of science produce nothing but good» [Nippert, 1986].

The modern scientific community and society try to establish strategies to regulate genetic technology and put control over the Human Genome Initiative and other protocols on genetic experimentation [Annas, 1990]. Is this an indirect indication that the possibility of creation of monsters cannot be excluded, as Hesiod foresaw? Hesiod seems well aware of the destructive power of the model of his counter-cosmos represented by his monsters. By hedging in the family through endogamous unions and thus cutting it off from the theogonic mainstream, he limits and encloses the contagion of their chaotic promiscuity. They belong to a primitive but passing, although perhaps necessary, phase of cosmic evolution. All the surviving members of the clan are integrated into Zeus' regime or rendered harmless at the end of the earth, literally marginalized. Finally, in setting the demi-gods, the hybrid heroes, against the other hybrid monsters, Hesiod calls attention to the different kind of *μίξις* (mixing), the one positive and controlled, the other destructive and disordered [Clay, 1993]. The difference is that nowadays we try to prevent such a possibility of creating monsters that could be out of the control of their creators, because no demi-gods are around anymore: just high resolution technology having the capacity to alter the nature of the human species. The new genetic achievements can be either positive and controlled or destructive and disordered.

Hesiod gives us impressive answers to questions about the cosmogony, the present-beings and about those that are possible-to-be. In the geneticists' brave new world, let us not neglect Hesiod's invaluable message.

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# NOTE ADDED IN PROOF

A case of a partly parthenogenetic male child has been recently described by Strain L, Warner JP, Johnston T, Bonthron D (1995): A human parthenogenetic chimera. *Nature Genet* 11:164–169.

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